

CRS Report for Congress

Received through the CRS Web

Nuclear Power Plants: Vulnerability to Terrorist Attack

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Summary

Protection of nuclear power plants from terrorist attack has become a current concern in light of the September 11 attacks. Assault by land from armed terrorists, and the threat of crashing a hijacked airliner into a reactor, are possibilities being studied as regulations and protection measures are reviewed and revised. Several bills to increase nuclear power security measures and requirements were introduced in the 107th Congress, but none passed. Similar legislation has been introduced in the 108th Congress.

Nuclear power plants have long been recognized as potential targets of terrorist attacks, and critics have long questioned the adequacy of the measures required of nuclear plant operators to defend against such attacks. Following the September 11, 2001, attacks on the Pentagon and the World Trade Center the Nuclear Regulatory Commission (NRC) activated its Emergency Response Center and advised all plant operators to go to the highest level of security alert. NRC also began a “top-to-bottom” review of its security requirements. On February 26, 2002, the agency issued “interim compensatory security measures” to deal with the “generalized high-level threat environment” that continued to exist, and on April 29, 2003, it issued three regulatory orders to all licensed nuclear power plants that formally set regulatory changes to meet the security threat.

Security Regulations

Under the regulations in place prior to the September 11 attacks, all commercial nuclear power plants licensed by NRC have a series of physical barriers to accessing the operating reactor area, and are required to maintain a trained security force to protect them. The plant sites are divided into three zones: an “owner-controlled” buffer region, a “protected area,” and a “vital area.” Access to the protected area is restricted to a portion of plant employees and monitored visitors, with stringent access barriers. The vital area is further restricted, with numerous additional barriers and access requirements. The security force is subject to stringent pre-hiring investigation and undergoes extensive training.

Design Basis Threat. A key element in protecting nuclear plants is the requirement that simulated terrorist attack exercises, monitored by NRC, be carried out to test the ability of the plant operator to defend against them. The severity of attacks to be prepared for are specified in the form of a “design basis threat” (DBT), which came under attack by critics of NRC’s regulatory system. One of the three regulatory orders issued April 29 changed the DBT to “represent the largest reasonable threat against which a regulated private guard force should be expected to defend under existing law,” according to the NRC announcement. The details of the revised DBT were not released to the public.

Emergency Response. After the 1979 accident at the Three Mile Island nuclear plant near Harrisburg, PA, Congress required that all nuclear power plants be covered by emergency plans. NRC requires that within an approximately 10-mile Emergency Planning Zone (EPZ) around the plant the operator must maintain warning sirens and regularly conduct evacuation exercises monitored by NRC and the Federal Emergency Management Agency (FEMA). In light of the increased possibility of terrorist attack that, if successful, could result in release of radioactive material, critics have renewed calls for expanding the EPZ to include larger population centers.

Another controversial issue regarding emergency response to a radioactive release from a nuclear power plant is the distribution of iodine pills. A significant component of an accidental or terrorist release from a nuclear reactor would be a radioactive form of iodine, which tends to concentrate in the thyroid gland of persons exposed to it. Taking a pill containing non-radioactive iodine before exposure would prevent absorption of the radioactive iodine. Emergency plans include distribution of iodine pills to the population within the EPZ, which would protect from exposure to radioactive iodine, although giving no protection against other radioactive elements in the release. Proposals to strengthen emergency procedures often include wider stockpiling and distribution of iodine pills.

Nuclear Plant Vulnerability

Operating nuclear reactors contain large amounts of radioactive fission products which, if dispersed, could contaminate soil and vegetation, and be ingested by humans and animals. Human exposure at high enough levels can cause both short term illness and death, and longer term deaths by cancer and other means.

To prevent dispersal of radioactive material, nuclear fuel and its fission products are enclosed in metal cladding within the reactor vessel. Because the heat from the radioactive fission products could melt the fuel-rod cladding even if the reactor was shut down, the fuel core is kept constantly covered with circulating water. A major concern in operating a nuclear power plant, in addition to controlling the nuclear reaction, is assuring that the core does not lose its coolant and “melt down” from the heat produced by the radioactive fission products within the fuel rods.

To protect the reactor and its associated control equipment, a large “containment” building, made of steel-reinforced concrete often many feet thick, is built over the central part of the plant. If a reactor did lose its coolant and experience a melt-down, the containment if intact would prevent dispersal of most of the radioactive material in the reactor, except perhaps for some radioactive elements that are in the form of gases. Without a breach in the containment, and without some source of dispersal energy such

as a chemical explosion or fire, the radioactive fission products that escaped from the melting fuel cladding mostly would remain where they were. The two melt-down accidents that have taken place in power reactors, at Three Mile Island and at Chernobyl in the Soviet Union in 1986, illustrate this phenomenon. At Three Mile Island, loss of coolant caused the fuel to melt, but there was no fire or explosion, and the containment prevented the escape of significant amounts of radioactivity. At Chernobyl, which had no containment, a hydrogen explosion and a fierce graphite fire caused a significant part of the radioactive core to be blown into the atmosphere, where it contaminated large areas of the surrounding countryside and was detected in smaller amounts literally around the world.

Vulnerability from Air Attack. Nuclear power plants were designed to withstand hurricanes, earthquakes, and other extreme events, but attacks by large airliners loaded with fuel, such as those that crashed into the World Trade Center, were not contemplated when design requirements were determined. NRC announced that its review of security regulations would include a detailed engineering analysis of the effects of such a crash, but that analysis has not yet been completed.

In light of the possibility that an air attack might penetrate the containment building of a nuclear plant, some interest groups have suggested that such an event could be followed by a melt-down and contamination and exposure of a large numbers of persons to escaping radioactivity. Nuclear industry spokespersons have countered by pointing out that small, low-lying nuclear power plants are poor targets for attack, and have argued that penetration of the containment is unlikely, that even if it occurred it probably would not reach the reactor vessel. They suggest that a sustained fire, such as that which melted the structures in the World Trade Center buildings, would be impossible unless an attacking plane penetrated the containment completely, including its fuel-bearing wings.

Regulatory and Legislative Proposals

Critics of NRC's security measures have demanded both short-term regulatory changes and legislative reforms. Among the former are calls for National Guard troops at all nuclear sites, as well as installation of anti-aircraft weapons to defend against air attack. A taped interview shown September 10, 2002, on Arab TV station al-Jazeera, which contains a statement that al-Quaida initially planned to include a nuclear plant in its 2001 attack sites, intensified the calls for action. Then-NRC Chairman Richard Meserve, responding to news reports concerning the interview, said that although nuclear power plants "are clearly on potential target lists for al-Quaida," there has been no information suggesting that a nuclear plant has been specifically targeted. He reiterated previous assertions of increased security and vigilance on the part of NRC and the nuclear power industry in response to the attacks.

Expedited action to strengthen and broaden the DBT was also called for. Critics complained that the terrorist attack specified in the DBT was unrealistically small, and should be increased to include a number of separate, coordinated attacks. A report issued by the private organization Project On Government Oversight (POGO) September 12, 2002, said that measures to increase security since the terrorist attacks have been ineffectual. It reported that "more than 20" security guards at 13 nuclear plant sites complained in anonymous interviews that the security forces were "under-manned, under-

trained, under-equipped, underpaid, and unsure” about the use of deadly force in protecting the facilities.

Critics also claimed that nearly half of the plants tested in NRC-monitored mock attacks failed to repel even the small forces specified in the original DBT, a charge that industry sources vigorously denied. Critics also pointed out that licensees are required to employ only a minimum of five security personnel on duty per plant, which they argue is not enough for the job. Nuclear spokespersons responded that the actual security force for the 100-odd nuclear reactors numbers more than 5,000, an average of 50 per reactor.

In February 2002, NRC implemented what it called “interim compensatory security measures,” including requirements for increased patrols, augmented security forces and capabilities, additional security posts, installation of additional physical barriers, vehicle checks at greater stand-off distances, enhanced coordination with law enforcement and military authorities, and more restrictive site access controls for all personnel. The orders issued April 29, 2003, expanded on the earlier measures. In addition to the revised DBT, they ordered tighter work hour control and stronger training requirements for security personnel, and increased background check requirements for those authorized to access critical areas.

Legislation. Several bills were introduced dealing with security in nuclear power plants in the 107th Congress. The House on November 27, 2001, passed H.R. 2983, reauthorizing the Price-Anderson nuclear indemnification act; included in the bill was a section on “Nuclear Facility Threats” (Sec. 12). The act would have required NRC to identify threats to nuclear plants, issue regulations changing the DBT to meet those threats within 270 days, and carry out periodic force-on-force tests based on the new DBT. In the 108th Congress, similar provisions were included in the omnibus energy bill, H.R. 6 (Sec. 14012), as passed by the House on April 11, 2003.

More comprehensive changes in nuclear power plant security were contained in H.R. 3382, introduced by Representative Markey. A major feature of this bill would have been to create a federal force within the NRC to replace the private guards now carrying out the task of defending against terrorist attack. The proposal created alarm in the nuclear industry, and also at NRC, where Chairman Meserve declared that the current system is satisfactory and complained that having to hire a federal force would triple the size of the NRC and divert it from its function as an independent regulator of nuclear safety and security. The sponsors of federalization draw an analogy to the action in the Aviation and Transportation Security Act (P.L. 107-71) to federalize airport security personnel, but Meserve and other critics pointed to the stringent hiring and training requirements, the higher pay, and 90% retention rate of the nuclear security force to rebut the comparison with airport personnel.

Other provisions in the Markey bill would have required stockpiling of iodine pills in regions around nuclear plants, and exercises by federal, state and local emergency response personnel within a 50-mile radius of plants.

House and Senate conferees, meeting to resolve differences in comprehensive energy policy legislation (H.R. 4), on September 12, 2002, voted to adopt language reauthorizing the Price-Anderson Act, but left out the nuclear power plant security provisions in H.R. 2983. Proposed amendments similar to the Markey provisions were also voted down by

the conferees. The 107th Congress adjourned sine die without the conferees reaching agreement on H.R. 4.

Senator Reid's Nuclear Security Act (S. 1746) as originally introduced contained many provisions similar to those in H.R. 3382. However, Senator Reid later introduced a substitute version of the bill, which was approved by the Senate Environment and Public Works Committee on July 25, 2002 (S.Rept. 107-335). The substitute bill would have appointed a task force to review security at U.S. nuclear power plants, required the President to establish a federal team to coordinate protection of air, water and ground access to nuclear power plants, and would have given statutory authority to NRC's recently established Office of Nuclear Security and Incident Response.

NRC Chairman Meserve, testifying before the House Energy and Commerce subcommittee on oversight and investigations December 5, 2001, identified several legislative initiatives which he said would help the agency upgrade nuclear power plant security. One proposal would authorize guards at NRC regulated facilities to carry and use firearms to protect property of significance to the common defense and security, a measure he said would protect guards from state criminal prosecution for actions taken during performance of their duties. A similar measure would counter some state laws that preclude private guard forces from utilizing some weapons by authorizing them to possess and use weapons comparable to those available to DOE guard forces to protect against the DBT. Provisions similar to these were included in S. 1746 as reported by the Environment and Public Works Committee. However, the bill was not taken up in the Senate or the House before adjournment.

In the 108th Congress Senator Reid introduced the Nuclear Security Act of 2003 (S. 131) containing measures similar to the version of S. 1746 reported out of committee, including a measure allowing employees of NRC licensees to carry weapons. Senator Daschle included similar provisions in his Comprehensive Homeland Security Act of 2003 (S. 6). The authorization for NRC licensees to carry weapons is included in H.R. 6 as passed by the House (Sec. 14026).